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ABSTRACT

The Echoic Response Inventory for Children (ERIC) is part of a test battery which includes the Expressive Vocabulary Inventory (EVI) and the Children's Auditory Discrimination Inventory (CADI), designed to assess language skills of disadvantaged children. These tests also seek to provide data that can help determine what changes in language performance may be attributed to replicable types of instructional programs. Performance on the ERIC represents a composite measure of auditory perception, verbal output, range of sentence memory, and accuracy of phonemic reproduction. Thus, it should provide a good basis for deciding whether a child is ready to begin reading. The ERIC consists of a series of 20 sentences, arranged in order of increasing difficulty. Children hear the sentences one at a time and are asked to repeat them. They receive a score of either "credit" (1 or no mistakes) or "no credit" (2 or more mistakes). The ERIC was tested on 450 preschool children of varying sex, age, race, and socioeconomic status to see if any of these variables affected test performance. Analysis of variance treatment of results showed that main effects were found for age and SES, but not for race or sex. The instrument was found to be a useful tool for assessing a child's level of readiness for beginning reading instruction. (MH/Author)

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ECHOIC RESPONSE INVENTORY FOR CHILDREN (ERIC)[1]

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The relationship between perceptual ability and the acquisition of language skills has such a beguilingly compeling reasonableness that it has been the subject of extensive research. With the national effort to break the poverty cycle, and the accompanying availability of generous federal funds for the development of effective instructional programs, the proliferation of research attempting to relate perceptual abilities to beginning reading has reached a new peak.

Even before the current interest in intervention, the problems of dyslexia with middle-class children gave rise to a seemingly endless literature ranging from highly subjective books and popular magazine articles to statistical data from tightly controlled experiments applying operant conditioning to phoneme-grapheme discrimination learning. Reports of the latter type appeared in specialized professional journals which teachers of reading rarely read. A brief review of some of the professional literature has been presented by the present author (Stern, 1969 a, b).

The degree to which the child's performance on an echoic task is a function of familiarity with the speech in which it is presented (dialect vs. standard English) has been questioned by a number of investi-

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gators. Cazden (1967) notes that:

> To the extent that analogical errors indicate the rules in children's grammars, these data suggest that dialect differences do not make much difference at these early stages. It seems likely that those parts of the structure of English which children learn first are the same across dialects, and it seems even more likely that the strategies or processes by which children learn that structure are also the same (p. 17).

Osser (1968) reports a study designed to contrast the code and dialect features of the speech of lower class black with that of middle class white children. Two tasks were included: sentence repetition and picture selection. A Critical Structures Error score (CSE), a Comprehension Error score (CE) and a Total Error score (TE) were determined for each subject. The study measured the following deviations: 1) Omission of noun or verb inflection; 2) Omission of a word; 3) Change in tense of verb; 4) Change in number of noun or verb; 5) Morphological error ("hisself" for himself); 6) Word substitution with same part of speech; 7) Word substitution with different part of speech; 8) Importation of word; and 9) Transposition of word order within sentence. In contrast to Cazden, Osser found that the black lower class children consistently made more errors than the white middle class children, recoding sentences in the imitation task regardless of whether or not comprehension occurred.

Three factors may account for the discrepant findings: 1) Differences in the graphemic construction of the words; 2) Variation in the affective quality of the words used in testing; and 3) Social class differences in environment affecting the kinds and degree of effective perceptual discrimination training received. To elaborate on the third factor, there is general consensus that the socioeconomic status of the child's family is an influential variable affecting his linguistic achievement. Hess and Shipman (1966), Bernstein (1964), and Irwin (1960) found a significant

relationship between social class and language ability of children. These studies indicate that the limited verbal interaction between the mother and child from a disadvantaged environment inhibits the child's acquisition of verbal facility. In addition, the amount of meaningful child-adult contact is decidedly restricted; lower class young children interact primarily with siblings and peers. Bossard (1954) found that lower class adults were less apt to eat their meals with their children, whereas in the middle class family mealtime is the occasion for a great deal of parent-child interaction.

Those who relate dialect to skin color may be interested to note that Deutsch (1964) found a relative absence of Negro-White differences on language measures with a sample of 167 children from similar economic backgrounds. These results suggest that socioeconomic status is a more salient factor in determining language behavior than ethnicity, and that to speak of a "Negro dialect" may be inaccurate as well as misleading.

It is clear from the review of the empirical and theoretical findings that identifying relevant variables relating to language development in young children is a difficult and complex task. The variety of approaches taken and some of the factors causing variability in results suggest the need for developing an instrument applicable across socioeconomic groupings.

The Echoic Response Inventory for Children (ERIC) has been designed as part of a battery, including the Expressive Vocabulary Test (EVI) and the Children's Auditory Discrimination Inventory (CADI), to assess language skills of disadvantaged children. These measures should provide data to determine what changes in language performance may be attributed to replicable types of instructional programs. Compared to the CADI, which is a receptive test requiring a simple selection response to indicate the

ability to recognize differences in auditory stimuli, the EVI and the ERIC are more demanding: the child must produce the appropriate verbal response. While the EVI measures a comparatively low level of expressive language functioning, i.e. simple naming or labeling, the ERIC, superficially at least, taps an even simpler level, that of imitation or echoic responding. However, the basic assumption underlying the construction of the instrument is that the accuracy of the child's echoic response is related to his ability to imitate sentences with increasing number of morphemes and syntactical complexity. Performance on the test represents a composite measure of auditory perception, verbal output, range of sentence memory, as well as accuracy of phonemic reproduction, and thus should provide a good basis for deciding whether a child is ready to begin reading.

Description of the ERIC

The ERIC consists of a series of 20 sentences, arranged in order of linguistic complexity as well as memory load. The vocabulary, selected on the basis of the comprehensive word lists developed for the EVI (Stern, 1969 b) is well within the repertoire of children in the 3-6 age range. Two parallel forms were constructed and subjected to linguistic analysis to establish both comparability across forms and levels of complexity within forms. Two sentences are considered similar if they have the same basic structure, i.e., when diagramed they produce the same type of "tree" or category symbols. The hierarchy of complexity of the sentences within each form was based on the following considerations:

1) The complexity of the tree (amount of left-branching, embedding, etc.);
2) Total number of morphemes;
3) Type of transformational rule (the passive is considered more difficult than a direct question);

4) The number of transformational rules;

5) The number of morphophonemic rules.

Thus the simplest item in Form A is "Dogs bark;" in Form B it is "Birds fly." The most difficult in Form A is "If the ground is wet the children won't be able to play in the park;" in Form B it is "If the weather is cold the children won't be able to swim at the beach." While there are admittedly different semantic loadings between the paired sentences, an attempt has been made to maintain a balanced affective level between the two forms.

Theoretically, this test should be scored by an expert phonologist, with a point system based on the accuracy of the production of each phoneme. However, since this would be a highly impractical procedure, and since the major objective of the test is to get an estimate of available structure rather than refinements of enunciation, dialect differences, etc., it was decided to give one credit per sentence.

No credit was lost if the child said "runnin'" instead of "running" or "da" instead of "the", etc. However, if he said "He goin'" or "He go" it was considered an error.

Two methods of scoring correct sentences were compared with a random sample of 30 four-year-old children. First the tests were scored on the basis of no credit unless the echoic imitation was complete in all substantive aspects. The second method gave a full credit for the sentence eventhough the child made one error. The correlation between these two methods was .99. However, there was more spread (standard deviation of 4.8 vs. 3.9) when a single error was not penalized, and so this system of scoring was adopted in all subsequent evaluations.

The correspondence between the two forms was assessed by administering both sets of sentences to a homogeneous group of 47 children. Half

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the children were given Form A first and half Form B first. The correlation between the two forms produced an interform reliability of .91. (Spearman-Brown correction)

Another question which was tested in a preliminary study was the effect of the interaction between difficulty and fatigue. Thus, if children did poorly on the items in the second half of the test was it because these items were more difficult or because they got tired? For this study, the items of each of the two forms of the instrument were arranged in four different random orders. The resulting eight lists were administered to 118 preschool children. Since no significant difference attributable to order of item presentation was found, the order of sentences for the present test was based on the linguistic hierarchy of difficulty.

METHOD

Subjects

A total of 450 children, enrolled in nursery school, children's centers, or Head Start classes in a large urban setting were tested, with 254 receiving Form A and 196 Form B. There were 216 boys and 234 girls; 149 Caucasian and 301 Negro; 333 from low and 117 from middle-class socio-economic groups.[1] Three age levels were sampled, including 111 three-year-old, 237 four-year-old, and 102 five-year-old children.

All children were given the test on an individual basis. The test sentences had been pre-recorded on magnetic tape by a male speaker with professional training. Before turning on the tape recorder, examiners were instructed to establish rapport as well as task familiarity on a

[1] Assignment to SES group was based on a composite score obtained from: 1) A rating for the child's place of residence obtained from a Los Angeles County Census Study, which used income and education of parent as the criteria; 2) the occupation of the working parent. These two scores were summed to produce the SES rating.

personal basis. Only after the child responded to the practice items was the test begun. The tape provided five second intervals between sentences, which usually gave the child sufficient time to respond. If the child had not begun to respond by the end of four seconds, the examiner was instructed to stop the tape recorder and wait for the child's response. However, the examiner was not permitted to repeat the sentence; if the child asked for a repetition the examiner told the child to "try the next one."

Children were taken at random from the class setting into a quiet corner, preferably a separate room if one were available, for testing. Form A and Form B were presented alternately to successive children. Since Form A preceded Form B on the same reel of tape, and there was a natural tendency to start each testing session at the beginning of the tape regardless of whether or not Form B had been given in the previous session, the number of Form A tests given is slightly greater than the number of Form B tests.

RESULTS

The means and standard deviations by 6-month age groupings for Form A, Form B, and Forms A and B combined are presented in Table 1. The intra-test reliability coefficient (Spearman-Brown) is .90 for Form A and .89 for Form B. The test-retest inter-form reliability is .91, based on a sample of 47 four-year-old children from a homogeneous day care population.

To determine whether differences in performance on this test could be attributed to age, sex, race, or socioeconomic status variables, a four-way analysis of variance was carried out, with three levels of age and two levels each for sex, race, and SES. The means and standard deviations for these cells are presented in Table 2, which also includes

data for total Race, Sex, and SES variables, by age groups. The results of the analysis of variance (Table 3) show main effects for Age and SES significant at the .01 level but those for Race and Sex fall far short of significance. Except for Race X SES, which is just below significance at the .05 level, all interactions do not even approach an acceptable level of significance.

Inspection of the raw scores on Table 2 shows that in spite of popular notions about females being more verbal at an earlier age, there is no evidence of meaningful differences in test performance attributable to sex at any age level, or for race or SES groups. At the three-year age level there is very little difference in scores attributable to race and only slightly depressed scores for the low SES groups. Increase in scores from the three-year-old to the four-year-old is also rather minimal (1.9 over all children at both age levels). It is between the mean scores for four-year-olds and five-year-olds that major changes are evident, with the five-year-olds scoring an average of 3.3 points higher. At these age levels factors such as Race and SES seem to have an impact.

At the four-year level, differences based on SES increase, although there is no reliable superiority of white versus black children from low socioeconomic homes. However, at the five-year level there is considerable improvement in the scores of the Negro children within both economic groupings (3.5 and 4.2) whereas the white children show a gain of 2.5 and 1.8 in the middle and low SES groups respectively. The scores of the low SES white children are perceptibly below those for any other groups. These data support the Deutsch (1964) findings that major difference in language production is more a factor of social class than of skin color.

The relationship between mental ability and performance on the

sentence repetition task was tested with slightly more than half the total population. Table 4 presents the means and standard deviations on the Goodenough Draw-A-Man test and the Peabody Picture Vocabulary Test by major groups. As evidenced by the large standard deviations, there was a wide spread of ability within each group. The mean scores on the Goodenough, which is primarily a non-verbal measure, were all within the normal range; however, on the PPVT, the Negro and low SES populations were approximately one S.D. below that of the Caucasian and high SES groups, with progressive decrement across age levels.

The correlations between the ERIC and the two measures of mental ability are presented in Table 5. This table also includes correlations with chronological age and two other UCLA language tests: the Children's Auditory Discrimination Inventory (CADI), and the Expressive Vocabulary Inventory (EVI). All correlations are significant at the .01 level, with those for the verbal measures almost twice the size for either the perceptual or performance measure.

Finally, the question of the validity of the order of difficulty established by the linguistic analysis was examined. The per cent passing each item was determined and the items ranked on this basis. As can be seen in Table 6, there is some discrepancy between the empirically determined level of difficulty and that based on rules of transformational grammar. Grouping the sentences into four levels of difficulty, with five sentences at each level, there are five items in Form A and eight items in Form B which do not follow the postulated linguistic hierarchy. Since in no case is a sentence displaced by more than one level, the original order has been retained.

The difference in difficulty level between sentences which are linguistically equivalent provides confirmation that affective content

and/or meaningfulness is an important factor in how readily the sentence can be reproduced. Sentence #2 on Form A, "Babies drink milk" is the easiest item, even though it is one word longer than sentence #1, "Dogs bark." However, the equivalent sentence in Form B, "Horses eat grass" is actually eighth in the order of item difficulty. Sentence #6 on Form B, "All those girls like her" is fourth in difficulty, but the parallel sentence in Form A, "Both those kids hate him" is thirteenth. Here it seems that it is the affective difference between hate and like which may account for the wide discrepancy in level of difficulty between the two sentences which are otherwise so similar. In the case of sentence #7, the adjectives used are of a dissimilar order, thus "big" seems more familiar than "most," and the concept of girls sewing doll clothes is probably less meaningful than boys playing baseball. Finally, the last sentence, while most complex linguistically, contains familiar information and was considerably easier than the shorter #18 sentences which are concerned with more difficult concepts.

A table of percentile scores (Table 7) at three age levels provides a rough estimate of an individual child's performance.

DISCUSSION

The ERIC provides a quick and simple measure of the child's ability to reproduce meaningful structured language units relative to the present population. It takes less than 15 minutes to admister and can be easily scored at the time of testing. The score is not influenced by dialectical or pronounciation features.

Tape recordings of children's echoic responses are available, and it is hoped that these will be subjected to linguistic analyses. Certainly further exploration to determine the types of errors made would prove fruitful not only for increasing insights into language development but

also to provide guidelines for the preparation of remedial training programs.

The validity of the instrument as a predictor of school success has not been tested. However, follow-up studies will be made when the original group of children tested are in second grade. As it stands now, the instrument is a useful tool for assessing a child's level of readiness for beginning reading instruction.

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Table 1

Means and Standard Deviations on

Forms A & B and Forms A & B Combined

(6-month age groupings)

Age in months	Form A			Form B			Form A & B Combined		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
36-41	21	9.5	4.2	10	9.0	5.2	31	9.4	4.5
42-47	42	11.0	4.5	38	11.4	4.3	80	11.1	4.4
48-53	114	12.1	3.7	77	11.7	4.0	191	12.0	3.8
54-59	21	14.8	3.8	25	14.4	3.4	46	14.6	3.6
60-65	29	16.6	1.6	25	16.1	2.9	54	16.3	2.3
66-71	27	15.2	3.0	21	15.4	3.9	48	15.3	3.4
Total 36-71	254	12.8	4.2	19.6	12.8	4.4	450	12.8	4.3

Table 2

Means and Standard Deviations on Combined Forms

by Age (in months), SES, Race, and Sex

			36-47			48-59			60-71		
			N	Mean	SD	N	Mean	SD	N	Mean	SD
High	Negro	Boy	9	11.0	4.3	4	12.5	2.4	4	16.3	1.3
High	Negro	Girl	4	10.0	5.9	5	13.4	3.9	2	17.0	2.8
High	Negro	All	13	10.7	4.6	9	13.0	3.1	6	16.5	1.6
Low	Negro	Boy	23	11.5	4.6	74	11.7	4.1	34	16.1	2.3
Low	Negro	Girl	24	9.5	4.4	81	11.8	4.1	37	16.2	2.6
Low	Negro	All	47	10.5	4.5	155	11.9	4.0	71	16.1	2.4
High	White	Boy	14	11.7	4.3	23	14.7	3.3	2	16.5	.7
High	White	Girl	18	11.6	4.2	22	14.5	3.2	10	16.6	1.3
High	White	All	32	11.7	4.2	45	14.6	3.2	12	16.6	1.2
Low	White	Boy	9	9.7	4.6	14	10.7	2.6	6	14.2	4.2
Low	White	Girl	10	9.1	5.0	14	13.0	3.7	7	12.3	5.6
Low	White	All	19	9.4	4.7	28	11.4	3.9	13	13.2	4.9
Total	Negro		60	10.5	4.5	164	11.9	4.0	77	16.2	2.4
Total	White		51	10.8	4.5	73	13.4	3.8	25	14.8	4.0
Total	Boys		55	11.2	4.4	115	12.2	3.9	46	15.8	2.5
Total	Girls		56	10.1	4.5	122	12.5	4.0	56	15.8	3.2
Total	High SES		45	11.4	4.3	54	14.3	3.2	18	16.6	1.3
Total	Low SES		66	10.2	4.6	183	11.8	4.0	84	15.7	3.1
Total	by Age		111	10.6	4.4	237	12.5	3.6	102	15.8	3.0

Table 3

ERIC (Combined Forms)

Analysis of Variance by Age, Race, SES, and Sex

	df	MS	F
Age (A)	2	347.69	24.01**
Race (B)	1	1.69	.12
SES (C)	1	123.38	8.59**
Sex (D)	1	.31	.05
A X B	2	18.16	1.25
A X C	2	3.81	.26
A X D	2	15.81	1.09
B X C	1	54.81	3.79
B X D	1	.13	.01
C X D	1	1.69	.12
A X B X C	2	1.66	.11
A X B X D	2	5.22	.36
A X C X D	2	5.28	.36
B X C X D	1	1.88	.13
A X B X C X D	2	5.13	.35
Error	426	14.48	

**$p < .01$ F = 6.85

Table 4

Mean and Standard Deviation by Age, Sex, Race, SES

for Two Measures of I. Q.

Group	Measure	Age in Months 36-47 Mean	36-47 SD	48-59 Mean	48-59 SD	60-71 Mean	60-71 SD
Sex							
Boys	Goodenough	96.6	12.8	95.4	19.7	108.9	22.7
	Peabody	98.9	27.7	94.0	26.3	91.8	22.3
Girls	Goodenough	103.8	19.4	103.4	19.9	105.4	24.8
	Peabody	101.0	31.5	88.3	24.2	110.4	27.9
Race							
Negro	Goodenough	98.9	15.8	99.5	19.6	108.3	25.0
	Peabody	82.2	20.1	84.5	22.3	93.9	26.1
Caucasian	Goodenough	101.6	21.6	99.6	21.4	103.9	22.0
	Peabody	112.9	28.7	106.6	24.3	119.2	22.3
Socioeconomic Status							
High	Goodenough	97.3	15.8	98.3	22.0	110.0	22.9
	Peabody	120.0	28.7	114.4	21.9	123.9	17.0
Low	Goodenough	102.7	21.0	99.9	19.6	105.2	24.5
	Peabody	88.0	23.0	85.0	22.6	92.6	25.8

Table 5

Correlations Between ERIC and Chronological Age (in months)

With

Goodenough, PPVT, CADI, and EVI

N = 252

	r	Mean	SD
Chronological Age	.43**	49.8	3.5
Goodenough	.35**	47.9	8.4
PPVT	.51**	41.6	10.5
CADI	.34**	27.2	4.7
EVI	.67**	20.5	6.3

**$p < .01$

Table 6

ERIC

	Form A		Form B	
Order of Difficulty	Test Order	Per Cent Passing	Test Order	Per Cent Passing
1	2	.90	1	.89
2	5	.86	5	.85
3	1	.85	3	.83
4	7	.82	6	.82
5	3	.82	9	.80
6	9	.77	8	.77
7	8	.75	4	.77
8	11	.74	2	.76
9	4	.72	13	.74
10	13	.72	11	.72
11	10	.62	7	.60
12	15	.56	10	.59
13	6	.54	12	.56
14	12	.52	14	.55
15	14	.50	15	.53
16	20	.32	17	.43
17	17	.31	16	.31
18	16	.18	20	.18
19	19	.09	19	.07
20	18	.06	18	.05

Table 7

Percentile Scores by Age (in months) on

Forms A & B Separately and for Total Population

Items Correct	Form A N=260			Form B N=190			Form A & B (Total Population) N=450		
	36-47	48-59	60-71	36-47	48-59	60-71	36-47	48-59	60-71
19-20	100	100	100	100	100	100	100	100	100
17-18	98	97	85	100	98	82	99	97	84
15-16	84	88	57	98	82	50	90	86	54
13-14	72	68	22	78	67	23	75	67	22
11-12	54	45	9	57	46	16	55	45	12
9-10	39	27	4	39	29	7	39	28	5
7-8	28	14	2	26	18	5	27	15	3
5-6	18	9	2	15	9	2	17	9	2
3-4	8	5	2	13	5	2	10	5	2
1-2	3	2	0	2	0	2	3	1	1